

Conference Title: Current Developments in Lens Design and Optical Engineering

Abstract Title: Design, Tolerancing and alignment of pushbroom imaging spectrometers for high response uniformity

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Abstract text:

We present a design, tolerancing and alignment approach that permits the achievement of a high degree of spatial and spectral uniformity of response from a pushbroom imaging spectrometer. Such uniformity of response is crucial for the extraction of accurate spectroscopic information from remotely sensed data. The spectrometer system example comprises two independent spectrometer modules covering the 400-2500 nm range, separated through a dichroic mirror. The relative merits of alternative approaches are briefly reviewed before concentrating on the problem of building a flightworthy system that can approximate its design performance. The tolerancing approach is unusual in that it requires simultaneous monitoring of many parameters, specifically: overall image quality, spectral distortion, spectral MTF variation with field, spatial distortion, spatial MTF variation with wavelength, and slit magnification to within a small fraction of a pixel. Tolerance values on the components and their positioning are primarily guided by the need to achieve the same magnification between the two spectrometer modules, as well as by the interferometric alignment method. We also present experimental results from a single spectrometer breadboard module that confirm the achievement of high response uniformity.